



NUC E 590 SEMINAR

Nuclear Engineering

Thursday, January 31, 2008

*Seminar at 4:00 p.m.—135 Reber
(Reception at 3:30 p.m.—hallway outside of 121 Reber)*

Jin Ho Song

Korea Atomic Energy Research Institute

Research on the Multiphase Flow for the Nuclear Reactor Safety at Korea Atomic Energy Research Institute (KAERI)

The abundant electric energy coming from the nuclear power plant was one of the driving forces which enabled a rapid economic growth in Korea. Now, Korea has 14 PWRs and 4 CANDU reactors in operation. Research on multiphase flow and heat transfer are carried on by utilities, vendors, national labs, and universities to evaluate the safety margin of operating reactors and enhance the safety of operating and advanced reactors to be built.

Research on the two-phase flow and heat transfer has been extended to multiphase, multi-component, multi-dimensional fluid flow and heat transfer phenomena after the event of a severe accident like Three Mile Island and Chernobyl accidents. As typical severe accident phenomena, such as molten fuel and coolant interaction and molten core concrete interaction, accompany highly complicated phenomena of multiphase, multi-component fluid flow and heat transfer in a multi-time scale, research had to heavily rely on the experimental investigation to simulate prototypic conditions. Also, development of Advanced Light Water Reactors (ALWR) and GEN-IV reactors, which rely on natural forces, opened a door to the multi-dimensional multi-phase flow phenomena.

KAERI (Korea Atomic Energy Research Institute) was active in the nuclear reactor safety research since mid nineties and is now involved in cutting edge research field, such as experimental investigation of multi-dimensional two phase flow phenomena (e.g., Multi-dimensional Investigation in a Down comer Annulus Simulation: MIDAS), development of multi-dimensional system code, and development of advanced instrumentations for the closure of two-fluid model.

KAERI is also active in the area of severe accident research and leading some of the field in the world, such as Test for Real cOrium Interaction with water (TROI) program. It is an experimental program on steam explosion using prototypic material of UO_2 and ZrO_2 mixture, where they have found a strong effect of material on the strength of steam explosion. KAERI and CEA of France launched a joint OECD/SERENA program on the steam explosion since November, 2007.

Having interest in developing an advanced version of APR1400, utilities and KAERI initiated a collaborative research program for the development of innovative (simple, robust, and economic) engineered safety features for the mitigation of design basis event and severe accident by using the test facilities and expertise accumulated. The goal it to develop a nuclear power plant which is competitive with other energy sources.